HORIZONTAL MOUNT OF SUSPENSION ELEMENT TO AXLE

BACKGROUND OF THE INVENTION

[0001] This invention relates to a mount for attaching a suspension element to an axle, wherein little space is required beneath the axle, since the attachment elements are on the axle sides.

[0002] Modern heavy vehicles are typically provided with an axle extending laterally across the vehicle. Suspension elements connect the axle to a vehicle frame, and to a bias element such as a spring or shock. In heavy vehicles, these axles may be fixed and attach rotating wheels at each lateral end. The connection of the suspension elements to the axle must be secure and rigid, such that forces transmitted to the axle are transmitted into the suspension elements, and such that the suspension elements can resist or otherwise accommodate these forces.

[0003] Historically, as shown in Figure 1A, suspension elements have been attached to an axle 11 with U-bolts 13. Generally, a U-bolt includes a U-shaped bolt having two threaded legs. Each U-bolt 13 is inserted over a frame element 15 and into openings in the top of the axle 11. The suspension element 7 is captured between the frame element 15 and the axle 11. Nuts are tightened onto the threaded legs of the U-bolts 13, and secure the suspension element to the axle.

[0004] Recently, fabricated and tubular axles have been developed that require a different clamp arrangement. One such axle 9 may be seen in Figure 1B. U-bolts 10 are inserted over a frame element 12 on one vertical face of the axle 9, and into openings in another frame element 17 on an opposed vertical face of the axle 9. The suspension element

7 is captured between the frame element 12 and the axle 9. The threaded legs of the U-bolts 10 receive nuts and extend underneath the axle, and thus take up space beneath the axle, and reduce ground clearance. It may sometimes be beneficial for a designer to have additional clearance beneath the axle, and thus the prior art U-bolts have not provided all of the design freedom that would be desirable.

[0005] Further, prior art U-bolts typically require periodic re-torquing, as there may be adjustment or loosening of the nuts. This is also undesirable.

SUMMARY OF THE INVENTION

[0006] In the disclosed embodiment of this invention, a clamp secures a suspension element to an axle with clamp elements arranged on the side of the axle. In a preferred embodiment, there are clamp elements on each side of the axle. The clamp elements secure holding frame members, which hold the suspension element on the axle. More preferably, the clamp elements have angled sides which cam or wedge angled sides on the holding frame members. The angled surfaces wedge the frame members toward each other as a bolt is tightened, providing a secure connection of the suspension element to the axle.

[0007] In a most preferred embodiment, one of the two holding frame elements receives the suspension member, with the suspension member extending through a channel in the one holding frame element. Preferably, the suspension member is closely guided in this channel, such that it is securely held.

[0008] These and other features of the present invention can be best understood from the following specification and drawings, the following of which is a brief description.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] Figure 1A shows a first prior art arrangement.

[0010] Figure 1B shows a second prior art arrangement.

[0011] Figure 2 shows a perspective view of an inventive axle and suspension mount.

[0012] Figure 3 shows an exploded view of the Figure 2 embodiment.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0013] An axle 20 is illustrated in Figure 2 secured to a suspension element 21. As known, there are preferably suspension elements at each lateral end of the axle 20, although only a single suspension element 21 is illustrated in Figure 2. In the illustrated embodiment, suspension element 21 has an upper spring member 22 and a more rigid underlying element 23. As shown, upper spring member 22 has a rear end 19 mounted through a pivot 15, as known. Underlying element 23 carries a forward bushing mounted in frame member 24 at forward end 119.

[0014] The suspension element 21 is secured to the axle 20 through a clamping arrangement 29, including an upper holding frame element 28 having a channel 30. As can be seen, the suspension element 22 extends through the channel 30, and underlying element 23 is received within the channel 30. Thus, the suspension element 21 is closely received in the channel 30.

[0015] Upper holding frame element 28 has side pieces 32. A lower holding frame element 33 having side pieces 34 is positioned beneath the axle 20. As shown in

Figures 2 and 3, holding frame element side pieces 32 and 34 have angled surfaces 36, and outer edges 38. Clamp halves 40 have similar angled sides 42 which cam along the surfaces 36 when a bolt 43 is tightened into second clamp halves 44. Second clamp halves 44 include similar angled surfaces 46. Preferably, the clamp halves 40 and 44 end inwardly of the outermost edges 38 of the upper and lower frame element side pieces 32 and 34.

[0016] As can be appreciated in Figure 2, there is little structure beneath the axle 20 in this embodiment. Notably, while the suspension element is mounted above the axle 20, in certain arrangements, the suspension element may be mounted beneath the axle. Even so, by eliminating the requirement of the bolts, etc. to be vertically below the axle 20, the present invention still increases ground clearance even for a vertically lower mounted suspension element.

[0017] Further, with the unique arrangement, a camming or wedging action occurring between the surfaces 36 and 42 and 36 and 46 ensures the holding frame elements 28 and 33 tightly secure the suspension element 21 to the axle 20. It is expected that periodic re-torquing will not be required, and at least would not be required as frequently as is required with the prior art U-bolts.

[0018] As can also be appreciated from Figure 2, one end of the suspension element 21 is secured to a frame bracket 24, shown schematically. The connection of this end is as known in the art.

[0019] Figure 3 is an exploded view and shows further detail. As can be seen, there are half-bolt channels 50 formed in the upper side pieces 32, and in the lower side pieces 34. As can also be appreciated, a connecting web 51 connects the lower side pieces 34.

[0020] The clamp halves 44, 40 each include a bolt hole 52 to receive the bolt 43. As shown, a nut 54 is threaded onto the bolt 43. As can be appreciated, the bolt 43 and nut 54 are within the vertical extent of the axle 20, or stated another way, intermediate the upper end 70 and lower end 71 of the axle 20. In this manner, no structure related to the bolts 43 or nuts 54 extends beneath the axle 20. Securement elements other than bolts may be used.

[0021] As further shown in Figure 3, washers 55 and nuts 54 on bolts 43 will force the clamp halves 40, 44 to move toward the holding frame elements 28 and 33 as the bolts 43 are secured in the nuts 54. This will further ensure the camming action to tightly hold the holding frame elements 28 and 33 on the axle 20.

[0022] Pin 100 passes through holes 102 and 104, and a corresponding hole in the spring member 22 to initially align these members.

[0023] Although a preferred embodiment of this invention has been disclosed, a worker of ordinary skill in this art would recognize that certain modifications would come within the scope of this invention. For that reason, the following claims should be studied to determine the true scope and content of this invention.